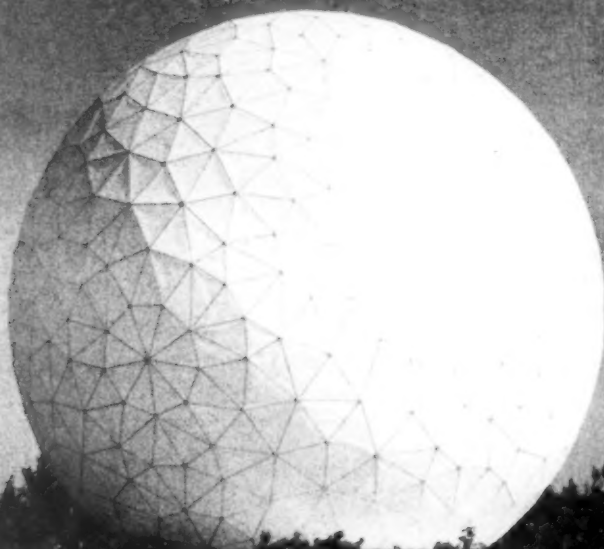


November 11, 1961

VOL. 80, NO. 20 PAGES 313-328

# SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE



Oversized Golf Ball?

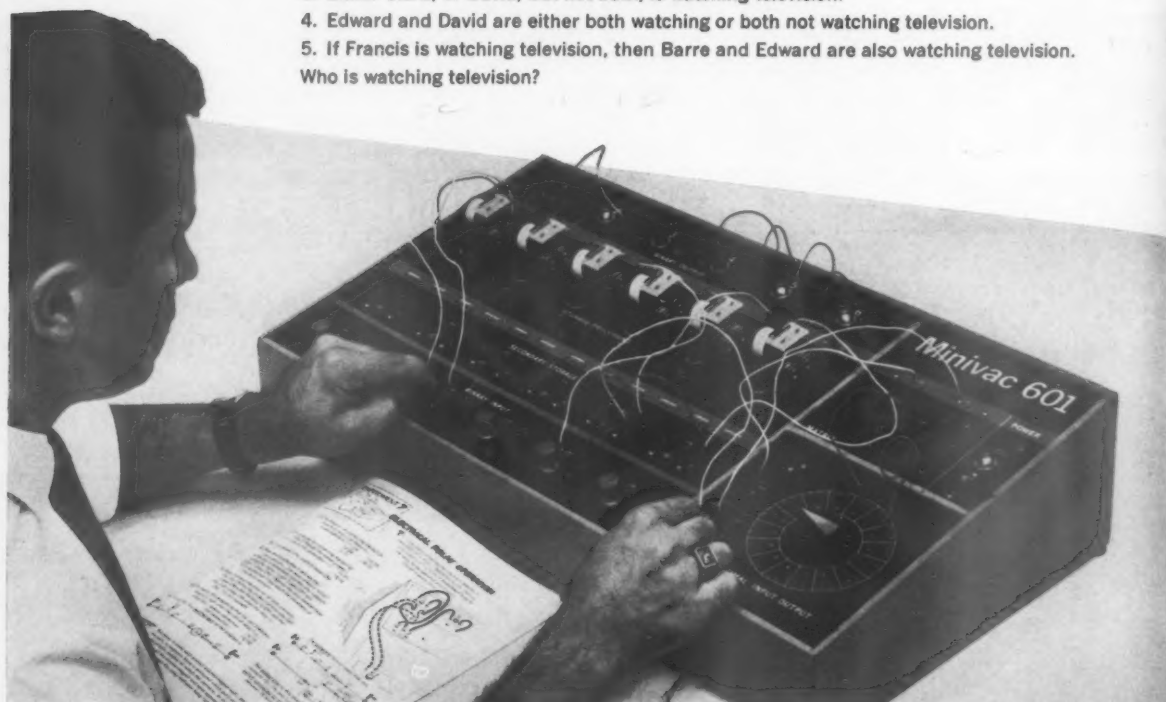
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A SCIENCE SERVICE PUBLICATION

Q

Barre, his wife, Clara, and their children, David, Edward, and Francis are at home. It is eight in the evening.

1. If Barre is watching television, so is his wife.
  2. Either Edward or Francis, or both, are watching television.
  3. Either Clara, or David, but not both, is watching television.
  4. Edward and David are either both watching or both not watching television.
  5. If Francis is watching television, then Barre and Edward are also watching television.
- Who is watching television?



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## SPACE

# Solid Fuel Breakthrough

Basic research scientists have succeeded in refiring solid rocket fuels which should lead to solid boosters capable of restarting in space, Tove Neville reports.

► **ROCKETS** into outer space powered by solid fuels will be stopped and started in the future.

United States scientists have overcome one of the biggest problems facing future space travel by refiring solid rocket fuel for the first time.

This achievement of experimental research is a giant step toward the huge boosters needed to launch heavy space "hardware" for orbiting space stations and manned bases on the moon and planets.

Solid fuel rockets have looked to many scientists like the "ideal" future boosters, except for one important drawback, the inability to relight the fuel, and thus control how much thrust, or lifting power, would be applied and for how long.

Now scientists at the National Aeronautics and Space Administration's Lewis Research Center, Cleveland, have found a method for refiring the fuel. Dr. Walter T. Olson, chief of the chemistry and energy conversion division at Lewis, told **SCIENCE SERVICE** that the refiring was successful experimentally. However, much work has yet to be done before the method can be applied to space-borne rocket boosters.

The important breakthrough was made by injecting spontaneously reacting liquids, such as chlorine trifluoride, into the solid propellant from a vessel with a valve. The valve can admit liquid to the solid fuel when the refiring process is desired.

Dr. Olson said the liquid reacts with aluminum in the propellant and also with many of the solid fuel binders, such as polyurethane and polysulfide. Repeated "starts" of the fuels were made during tests in thin atmosphere and under low pressures in the Lewis 20-foot wind tunnel and in test chambers.

Research was also done in connection with the refiring method in the laboratory to study the details on how ignited fluids react with solids.

At the present time the powder of solid fuel rockets is ignited by a one-shot explosive. When the new refiring method becomes operational, a liquid that can be admitted to the fuel whenever the rocket is to be restarted will replace the explosive.

Another very difficult problem of solid fuels is putting out the fire to shut off the rocket once it is in space, and perhaps give men a chance to unload gear for a space platform or moon base before they restart the rocket to take them back to earth.

Work is also being done at Lewis on the shut-off which is accomplished by opening a vent in the rocket case so the pressure drops very rapidly. Sometimes the fuel appears to have stopped burning but starts up again because there are still traces of combustion left. The trick is to drop the

pressure fast enough to make the fire go out entirely, Dr. Olson said.

He said the Lewis scientists are now studying how fast to drop the pressure for different kinds of propellants, among them polysulfide, polyurethane, and a mixture of nitrocellulose and nitroglycerin called double base.

The state of the art of solid rocket fuels has lagged behind that of liquids because solid fuel rockets have mainly been conceived as one-shot uncontrollable types whereas the liquid fuel rockets can be controlled. This has been the one great advantage of the liquid-type rocket and is probably the reason for the great use of liquid fuel for most space rockets.

Such space vehicles as the Redstone that carried the U.S. astronauts on their suborbital flights, the Atlas scheduled to orbit the first U.S. spaceman around the earth, and the Saturn, recently successfully tested and expected to send a space laboratory around the earth, use liquid propellants. Liquid rocket engines are also now planned for the Nova project vehicle that will take men to the moon. The liquid engine for the Nova, the F-1, has already been built and tested.

However, the liquid rockets have many drawbacks not found in the solids. The liquid engines are very complex, with countless tubes, valves and wiring that must be checked for malfunctioning just before launch. The procedure requires as much as 48 hours in some cases. The fuel has to be loaded into the engines at the last moment, and if the launch is postponed, the fuel is drained out again and the engines cleaned before a new launch is possible.

All this is expensive and time-consuming. The possibility for error and failure is also much greater the more complex the system, and the launching of liquid fuel rockets requires very large crews working many man-hours. An added burden is the handling of liquid fuels, such as the oxygen and hydrogen used for liquid rocket engines. These chemicals in liquid forms have to be handled, transported and stored at extremely low temperatures. Liquid hydrogen vaporizes if it is not kept at below minus 422 degrees Fahrenheit. The boiling point of liquid oxygen is minus 297 degrees Fahrenheit.

But once the liquid fuel is safely in the rocket and fired it is more efficient than solid fuel since it takes less liquid fuel than solid to lift the same weight.

Nevertheless, the advantages of solid rockets for large boosters are overwhelming. They are easier to fabricate, store, handle, transport (with the fuel already in the vehicle), and they cost much less. No fancy, complicated engine set-up is required. The

fuel merely is built into a stack that either burns from the center outward or from one end to the other.

More sophisticated solid rockets in sections are now being planned.

Solid fuel rockets are especially of great military importance because they can be easily transported to areas where liquid fuel transport would be very tricky if not impossible. Some of the most important solid fuel rockets to date are: the Navy's Polaris launched from submarines, the NASA Scout sounding rocket used to launch ionospheric probes, the Air Force Minuteman and the Army's Pershing. The Air Force plans the development of a solid fuel Saturn rocket in the immediate future. This program is expected to cost \$60 million or more.

• *Science News Letter*, 80:315 November 11, 1961

## PSYCHOLOGY

## Creative Thinking Found In Ninth Grade Students

► **ABILITY TO THINK** creatively can be spotted in high school freshmen as well as in young adults, Drs. J. P. Guilford, Philip R. Merrifield and Anna Cox of the University of Southern California reported to the National Academy of Sciences in Los Angeles.

The conclusion was based on test scores for several hundred boys and girls, including students of modern IQ as well as superior students. Essentially the same mental skills were found in all the ninth grade students as had been found previously in gifted adults, they reported.

• *Science News Letter*, 80:315 November 11, 1961



**ULTRA-PURE QUARTZ**—Heat-resistant fused quartz, made by General Electric Company, Cleveland, Ohio, is tested in a flame torch. The quartz, top tube, resists the heat considerably better than an imported product, lower tube. The new tube will be used in space sciences, electronics and lamp industries.

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## PUBLIC SAFETY

# Shelters Held Useless

► **FALLOUT SHELTERS** in areas hit by a nuclear bomb "seem only a means of delaying death," Dr. John N. Wolfe of the division of biology and medicine of the U.S. Atomic Energy Commission said in Washington, D. C.

"Thermal and blast effects and concomitant radiation would create vast areas that would be useless to the survival of man," the AEC biologist warned. "Add also fire, insect devastation and disease, and the picture in many areas becomes grim indeed."

In an interview with **SCIENCE SERVICE**, Dr. Wolfe took issue with recently publicized estimates that an adequate shelter program could mean the survival of 97% of the population.

"If that is true, and the devastation of a nuclear explosion can be so easily counteracted, then why should any of the nations develop nuclear bombs or consider using them as weapons against an enemy?" he asked. "You can more easily and humanely kill off three percent of the enemy population with rocks and sticks and bows and arrows."

Shelters represent only a part of a survival plan. No matter how adequate a shelter program may be, man eventually has to come out, Dr. Wolfe said. It appears likely that the environment into which he will emerge might result in a long setback to his biological and indeed psychological and mental creative developments.

The questions that have to be answered, therefore, are: "Where does man go after his sojourn in shelters? What does he do upon emerging?" Trying to find the answers to these questions is the object of special research now occupying biologists such as Dr. Wolfe in the AEC.

The answers will vary according to the nature of the environment hit by nuclear

explosions, Dr. Wolfe pointed out. "For example, what would face a man emerging from a shelter after a bomb hit New York is quite different from what would face a man coming out in a farm area in Arkansas."

The problem is to estimate the effects of such drastic modifications to varying environments and be able to provide some guidance. Consequently, a full assessment of the biological costs of nuclear conflict must be made.

• Science News Letter, 80:316 November 11, 1961

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## BIOLOGY

# Photosynthesis By Tiny Bacteria

► **THE GREEN PLANT** has no monopoly on photosynthesis. Bacteria can do it, too.

This was reported to the National Academy of Sciences meeting at the University of California, Los Angeles, by Drs. Daniel I. Arnon, A. Mitsui and A. Panecque of the University of California, Berkeley.

The discovery brings new understanding of the little understood process of photosynthesis, the scientists explained. They see the process as due to a flow of electrons set up when sunshine falls on a green leaf containing the green coloring substance chlorophyll. The same process follows when the enzyme, hydrogenase, from the sulfur bacterium *Chromatium* causes a flow of electrons from cystein when influenced by light. Cystein is an amino acid containing sulfur.

Thus, the first step in the photochemical act of the green leaf is identical with that of the bacterium.

• Science News Letter, 80:316 November 11, 1961



## CHEMISTRY—PHYSICS

# Nobel Prizes Awarded

► **UNRAVELING** the secret of how the green leaf utilizes the energy of the sun is a scientific goal as important in its probable consequences as the discovery of atomic energy itself.

Compared with the rewards that would come from an artificial duplication of nature's photosynthesis, the amount of money and brains being directed toward this problem is considered to be very small indeed. The researches recognized by the award of the Nobel Prize in Chemistry to Dr. Melvin Calvin of the University of California, Berkeley, are among the few intensive efforts at the solution of this great chemical mystery.

Dr. Calvin has approached this problem from two ends: determining how the biological process utilizes the light energy and how food and other substances are formed. In his laboratory at the University of California he is now working on filling in the knowledge between these two extremes in the photosynthetic process.

Dr. Calvin has had plans and dreams of a really adequate research effort on photosynthesis which would involve a considerable number of millions of dollars of support, comparable to the money that was spent making the atomic bomb and is now being spent on the extensive inquiry on the nature and cure of cancer.

The award of the Nobel Prize for photosynthetic research may catalyze a large effort of this sort with adequate financing from foundations.

Dr. Calvin has spent more than ten years on photosynthetic research using radioactive carbon, trying to resolve the basic steps

in the process, which sustains all life on earth. He has been able to trace the intricate chemical mechanism by which plants convert water, carbon dioxide and sunlight into sugars, proteins, carbohydrates and other energy-bearing materials.

With co-workers at the University of California, Dr. Calvin developed the method of using radioactive carbon to follow the complex series of chemical changes carbon dioxide goes through in plants to build larger molecules that eventually become basic foods for man and animals.

## Found Secrets of Nucleus

► **THE TWO PHYSICISTS** who won this year's Nobel Prize in Physics each increased man's knowledge of the atomic nucleus, or core.

Dr. Robert Hofstadter, 46-year-old physics professor at Stanford University, Stanford, Calif., was honored for his work using the Stanford linear accelerator to define the structure of the nucleus from the patterns produced when electrons are hurled at a hydrogen target.

Dr. Rudolf L. Mossbauer, now at California Institute of Technology, Pasadena, won the Nobel Prize for discovering in 1958 at the age of 30 that, under certain conditions, nuclei could emit or absorb gamma rays without any recoil, known as the "Mossbauer effect." Using this principle has already allowed scientists to confirm Einstein's principle of equivalence to determine the tiny magnetic field of the iron

nucleus, and to provide the most accurate clock yet available.

Equally important is the promise of the Mossbauer effect in the field of solid-state physics, from which has come the transistor among other devices.

While at the Universities of Munich and Heidelberg, Dr. Mossbauer showed that some nuclear gamma rays of low energy could be emitted or absorbed without recoil if the atomic nuclei were tightly enough bound in solids and the temperature reduced. Gamma rays are identical to X-rays but are emitted from the nuclei of atoms rather than from the atoms' electron cloud.

Binding the emitting or absorbing nuclei in a solid also eliminates the broadening



**WORKING ON PHOTOSYNTHESIS**—Dr. Melvin Calvin, winner of the Nobel Prize in Chemistry for his outstanding research in photosynthesis, is working in his laboratory at the University of California. Behind him is one of the columns in which he grows algae for his experiments.



**NOBEL PHYSICS PRIZE WINNER**—Dr. Rudolf L. Mossbauer, right, is receiving the 1960 Research Corporation Award from J. W. Hinkley, president of the foundation. Dr. Mossbauer received this award for the discovery of a nuclear effect that makes it possible to measure energy changes of one part in a million billion.



**HAPPY CO-WINNER** of the Nobel Prize in Physics, Dr. Robert Hofstadter, was awarded the prize for his studies of nucleons.

due to motion of the atoms caused by heat. In this way, radiation of phenomenally narrow frequency spread is provided, as well as an absorber perfectly matched in frequency.

The most recent result of the work of Dr. Hofstadter and his co-workers in probing the atomic nucleus is that two of the most fundamental building blocks of all matter appear to be virtually perfect mirror images of each other. They are the proton, which is a positively charged nuclear particle, and the neutron, a neutral one.

The proton is pictured as essentially a tight core of positive electric charge surrounded by two larger, somewhat diffuse and interpenetrating clouds, also of positive charge. The clouds are made up of mesons,

the nuclear particles believed to serve as the "glue" holding the nucleus together.

The neutron also has a hard core of positive charge, surrounded by two diffuse and interpenetrating meson clouds. In this case, however, one cloud is negatively charged while the other is positive and extends somewhat farther out from the hard core.

These "pictures" of the neutron and proton were selected as the best fit for experimental information gathered by Dr. Hofstadter and his co-workers from the scattering of electrons accelerated and hurled at hydrogen targets in the Stanford machine. They were "drawn" in terms of the distribution of electric charges within the nucleus.

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#### NATURAL RESOURCES

## Increase Oil Yield

► A HIGHER RATE of recovery from oil underground wells is the aim of a three-year program at the University of California.

Sometimes as much as 80% of the reserves remain underground after the pumping is finished and the derricks are dismantled.

Petroleum engineers have long looked for another method which could bring up the remaining oil not recovered through the traditional pumping process.

One such method is to flush out the oil with another liquid, but a number of basic chemical and geological problems have to be investigated in the laboratory before the flushing technique can be used in the field.

In trying to flush oil out of the ground, the flushing or pushing liquid is almost always less viscous or more fluid than the

oil. The pushing "piston" may be a natural gas, which must be separated from the oil by a "slug," or band, of propane to keep the gas and oil from mixing.

However, in certain porous earth layers the pushing process becomes unstable, causing the band to break down and the gas and oil to mix.

The major purpose of the research, under the direction of Dr. Richard L. Perrine, will be to discover under what conditions such instabilities in the flow process will develop. His fundamental studies, supported by the National Science Foundation, may lead to important future applications, mainly in the secondary recovery of oil.

Other uses may lie in protecting underground fresh water wells from encroaching sea water along the coastal strips, and in a variety of chemical engineering processes.

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and bring it to the extremely high temperatures necessary for controlled fusion.

A neutronic reactor structure of "novel construction" won patent No. 3,005,764 for Dr. Farrington Daniels of the University of Wisconsin, who assigned rights to the U.S. Government. His invention is a nuclear reactor that can be operated at very high temperatures for the most efficient use of the power generated in the reactor.

Dr. Glenn T. Seaborg, chairman of the Atomic Energy Commission, was awarded patent No. 3,005,680 for his method of separating neptunium from plutonium when both are dissolved in water.

Dr. John Strong of Johns Hopkins University, Baltimore, won patent No. 3,005,913 for an infrared range finder. Rights were assigned to the U.S. Army. He found an improved method for detecting and locating distant objects that, although invisible, send out weak infrared radiation.

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ON THE WAY TO HONOR—Ronald Sakimura says good-by to his mother, Mrs. Kanjiyo Sakimura, on his way to the Japan Student Fair.

#### GENERAL SCIENCE

## Hawaiian Pineapples Scientist's Gift to Japan

► WHEN Ronald Sakimura, age 15, came to Japan as the representative of about a million young American science fair entrants, he brought with him on his Pan American flight a crate of pineapples, as a gift to his hosts.

This fruit is typical of Hawaii where Ronald lives and won the science fair honors that caused SCIENCE SERVICE to send him to the Fifth Japan Student Science Fair.

The luscious fruit is not unrelated to young Ronald's project as he is an entomologist, specializing on nematodes, which are worm-like organisms in the soil. Insect pests must be subdued in Hawaii, as elsewhere in the world, to allow the growing of commercial crops.

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#### INVENTION

## Patents of the Week

► A MACHINE that can be used to control the fiery energy of the hydrogen bomb's fusion reactions has been patented.

It is called a "rotating plasma device," a plasma being a gas in which the atoms have been partially ionized, or separated into positive ions and negative electrons. Although electrically neutral as a whole, a plasma can conduct an electrical current.

The rotating plasma device will come into its own only after scientists have achieved long-time confinement of a plasma. This is the key to controlled thermonuclear fusion of such light elements as hydrogen, deuterium (double-weight hydrogen) and tritium (triple-weight hydrogen).

There are four basic methods being tested for confining a plasma, co-inventor James L. Tuck of Los Alamos Scientific Laboratory, Los Alamos, N.M., reported. These are the so-called "pinch effect," which has been found to be unstable; the Stellarator, a machine being built at Princeton University; the mirror configuration; and the "picket

fence," which is based on cusped geometry.

The "picket fence" method is the most recent and most promising approach, Mr. Tuck said. However, he noted, there are "many, many" combinations of these four methods being tried out at various laboratories around the country.

Patent No. 3,005,767 was awarded to Drs. Keith Boyer, Conrad L. Longmire, Darragh E. Nagle and Fred L. Ribe, and Jay E. Hammel and Mr. Tuck who assigned rights to the Government through the U.S. Atomic Energy Commission.

Their invention relies principally on the fact that an ionized gas can be contained and heated in a region of crossed magnetic and electric fields. Both fields are applied externally, so there is no reliance on the self-generated magnetic field of the plasma current to compress and thereby heat the plasma as in the "pinch effect" approach.

The rotating plasma device is one of the methods for obtaining a high rate of thermonuclear reactions, with more energy liberated than is required to ionize the gas

## PHYSICS

# Peaceful U.S. A-Bomb

► THERE IS A BRIGHT and good side to the development of nuclear bombs, that is, if you explode them only for peaceful purposes. To demonstrate the benefits of the bomb, the Kennedy Administration announced its approval of a nuclear experiment known as Project Gnome, a part of the Atomic Energy Commission's Plowshare Program to develop productive uses for nuclear explosives.

Within the next 60 days, the AEC will detonate a 5-kiloton nuclear bomb underground near Carlsbad, N.M. The explosion will be conducted about 1,200 feet underground and is designed to be contained so that no radioactivity will escape into the atmosphere.

However, re-entry into the cavity for scientific investigation and for determining the success of the four experiments of Project Gnome may result in release of small amounts of radioactivity, the AEC acknowledged. All possible precautions are being taken to keep the escaped radiation within permissible limits, the AEC said.

One of Project Gnome's experimental objectives is to explore the feasibility of converting the energy from nuclear explosives

into heat for producing electric power. If this should prove feasible, it may be possible to provide power at low cost for underdeveloped areas by exploding bombs in caves. The experiment may very well demonstrate that this cannot be done, John S. Kelly, director of the AEC Division for Peaceful Nuclear Explosives, said.

The other experimental objectives of the project are to investigate the practicability of recovering large quantities of such industrially and medically useful radioisotopes as cobalt, uranium and plutonium; to learn more about nuclear detonations in salt which has marked differences from the volcanic rock in which previous United States underground nuclear tests have been conducted; and to measure neutrons on a vast scale to learn more about the physical properties of matter.

For the last objective, Mr. Kelly said the explosion for Project Gnome will in a fraction of a second yield as many neutrons as would be produced in any known nuclear reactor, accelerating over a period of 3,000 years.

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## ASTRONOMY

# Meteorites Very Old

► BOTH STONY and iron meteorites last much longer on the earth's surface than was previously thought, two studies showed.

Dr. James R. Arnold of the University of California, San Diego, said that the Williamstown meteorite found in Kentucky had spent 600,000 years on earth after landing from somewhere in space. It was dated by the amount of radioactive chlorine-36 it contained, which was only one-quarter that found in meteorites from other recent falls. Dr. Arnold told the National Academy of Sciences meeting at the University of California, La Jolla, Calif.

Scientists have previously assumed that iron meteorites disappear by weathering in a relatively short period, at least in most climates. Investigation of other meteorites indicates that the earthly age of 600,000 years is not unusual.

Dr. Arnold's ages were a by-product of his study of possible time variations in the intensity of cosmic rays bombarding the earth during long periods in the past. The great resistance of these meteorites to corrosion is "puzzling," Dr. Arnold said.

Dr. Hans E. Suess of the University of California, San Diego, told the Academy that stony meteorites whose time of fall is unknown have been on earth from a few thousand to 20,000 years. He found this age by measuring the radiocarbon content of five meteorites that have fallen during the past few decades and comparing this amount with the radiocarbon content of stony meteorites of unknown age. The latter amount was much smaller.

Scientists have previously assumed that stony meteorites are also subject to weathering and disintegrate within a relatively short time after falling.

Cosmic rays hitting meteors while they are still in space produce radioactive com-

pounds that provide a way of telling the time elapsed since a meteorite fell, because radioactive compounds disintegrate at a known, steady rate.

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## ZOOLOGY

# Octopus Bores Through Shells to Reach Food

► THE OCTOPUS is a killing bore, especially at dinner time.

He bores his way into the shelled mollusks that provide him with food, injecting a venom that causes his victim to relax the muscles that keep the protective shell closed. In this way the octopus feeds on abalone, chiton and other shelled mollusks, Drs. M. E. Q. Pilson and P. B. Taylor of the Scripps Institution of Oceanography, La Jolla, Calif., report in *Science*, 134:1366, 1961.

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## TECHNOLOGY

# World's Largest Radome To Be Operated by MIT

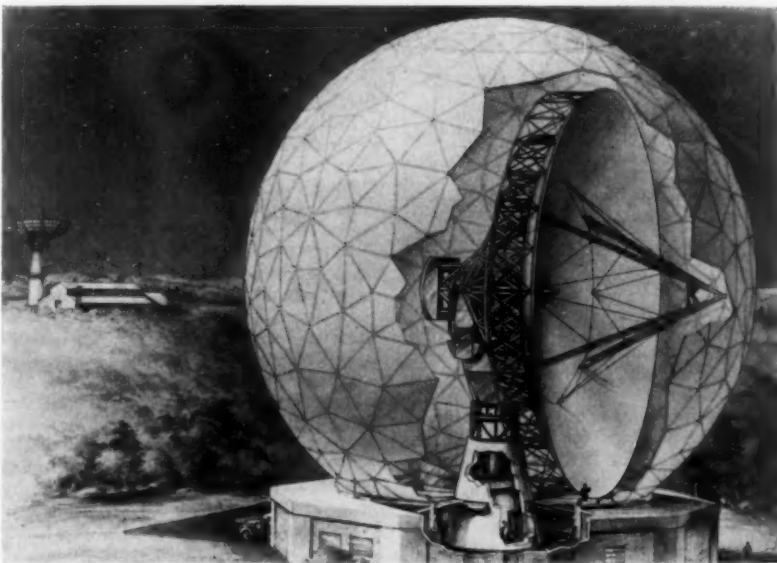
See Front Cover

The largest radome in the world will be the U.S. Air Force's Haystack Hill 150-foot-wide dome of white aluminum and glass fiber in Tyngsboro, Mass.

The dome, seen perched as an oversized golf ball on the cover of this week's issue, will hold a sensitive communications and space research antenna scheduled to begin operating by the end of 1962.

The radome was designed by Lincoln Laboratory of Massachusetts Institute of Technology which will also operate the facility.

• Science News Letter, 80:319 November 11, 1961



**CUTAWAY RADOME**—The 150-foot-wide Air Force radome will protect a communications and space research antenna expected ready in 1962.



## NUTRITION

**Protein Supplements Not Always Helpful**

► **PROTEIN FOOD** supplements may sometimes have the opposite of their intended effect.

Protein supplements added to foods without considering other components in the diet may actually reduce the growth rate of animals, Dr. Alfred E. Harper of the University of Wisconsin has reported. The sensitivity of the body to the balance of amino acids is much more delicate than has been thought.

Experiments showed that animals fed an unbalanced mixture of amino acids will choose protein-free diets if offered, even if this means they will not grow at all. It has been thought that excess amino acids were simply burned by the body, but apparently this is not always so; sometimes they can be harmful, Dr. Harper said.

The effectiveness of protein supplements in the diet depends greatly upon the use the body can make of the amino acid in the blood stream, which is sometimes much less than predicted chemically. Often during the processing of the supplement changes take place in the proteins that make them resistant to the digestive fluids. The amount of amino acids available from these proteins is thus decreased.

To help underdeveloped areas, the United Nations is sponsoring studies of protein supplements in food. A sometimes fatal disease, kwashiorkor, widespread among the children in areas of protein malnutrition, may be prevented or even cured by proper diet, Dr. Harper said.

Drs. Juan Sanahuja and H. E. Muelendere and others assisted Dr. Harper, with support from the Nutrition Foundation of New York and the National Institutes of Health.

• Science News Letter, 80:320 November 11, 1961

## EDUCATION

**"Ghost" Schools Plague Uncrowded Rural Areas**

► **ABOUT 30,000** "ghost" school districts, usually located in depopulated rural areas and too small to operate efficiently, are part of the current "double crisis" in American education, the Population Reference Bureau reports in Washington, D. C.

The other and more widely publicized problem is the need for more school facilities in fast-growing city and suburban areas.

"Both situations breed educational and economic wastage," the Bureau notes.

Dwindling school enrollment, however, is just as serious a problem to some communities as swollen enrollment is to others. About one-third of the "ghost" districts have no more than 25 school-age children, and some have no children at all.

"Tiny classes waste the efforts of teachers who could effectively teach twice as many children in larger, consolidated schools," the Bureau maintains.

The one-teacher, "little red schoolhouse" still makes up about one-fifth of all public

schools, but is fading fast. Many small districts already have consolidated into larger, more practical units—sometimes by order of state authorities, since residents are often reluctant to give up tax advantages and local self-rule.

In the last decade, more than half of the states lost rural residents, although all states gained in urban population. Despite the overall United States population jump from 151,000,000 to 179,000,000, almost half of the nation's counties lost population.

While the nation was short 142,160 public school classrooms in 1960, about 15,000 classrooms were abandoned in sparsely populated regions.

Total enrollment during the new school year is expected to run 1,800,000 over last fall. The school-age population has grown twice as much as the total population, and more than five times as much as the age groups from which teachers are supplied, the Bureau said.

Operating costs for U. S. public elementary and secondary schools hit a record high of \$15.6 billion in 1959-60, a \$2 billion increase over 1957-58, according to the latest U. S. Office of Education biennial survey. Capital outlays for land, buildings and equipment, however, showed a seven percent drop. Average annual salaries for teachers, principals and supervisors rose from \$4,703 to \$5,135, a nine percent increase.

• Science News Letter, 80:320 November 11, 1961

## VIROLOGY

**Barnyard Animals Source Of Asian Flu Epidemic**

► **THE SOURCE** of the great Asian influenza epidemic of 1957 may have been a pig, duck or chicken in a Chinese barnyard.

Dr. A. F. Rasmussen, University of California, Los Angeles, Medical School virologist, said that evidence collected in recent years suggests that human influenza viruses are related to a number of viruses that cause respiratory infections among certain domestic animals.

Because the Asian flu virus was markedly different from viruses that had caused previous flu epidemics, it may have sprung from some animal "reservoir" rather than from a mutation of a human virus strain.

Dr. Rasmussen recently returned from Formosa and Southeast Asia where he attempted to track an animal virus that may have been the culprit in the epidemic.

He found that the Asian flu virus and at least four animal viruses studied in Asia—swine, duck and equine influenza and fowl plague—are closely related. All these viruses had an enzyme, sialidase, that helps prepare the cellular invasion route of the virus, Dr. Rasmussen said.

None of the animal viruses so far studied is likely to be the culprit. But the similarity of the animal viruses to the Asian influenza virus supports the suggestion that some domestic or wild animal, perhaps on the Chinese mainland, may have harbored the original virus.

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**IN SCIENCE**

## MEDICINE

**Internal Cancer Linked To Skin Ailment**

► **A SIGNIFICANT RELATIONSHIP** between the occurrence of internal cancer and a skin ailment has been found.

When a precancerous skin ailment known as Bowen's disease appeared on the exposed trunk, arms and legs of patients a significant increase in the number of associated internal cancers was noted in a study reported in the Archives of Dermatology, 84:139, 1961, published by the American Medical Association.

Internal cancer was also linked to precancerous lesions on exposed areas such as the upper neck, face and hands, but this was reported less often true because of the difficulty in clearly establishing a diagnosis of Bowen's disease.

Conclusions of the report were based on a study at the University of Minnesota Medical School, Minneapolis, of the records of 53 patients in whom Bowen's disease had been diagnosed. The study was conducted by Drs. Edward S. Peterka, Francis W. Lynch and Robert W. Goltz.

The researchers combined data in this study with previous reports and concluded that approximately one-third of the patients with Bowen's disease develop internal cancer at an average of six to ten years after the first diagnosis of the skin ailment.

Thorough examinations for internal cancer, therefore, were advised especially for patients with Bowen's disease affecting unexposed parts of the body.

• Science News Letter, 80:320 November 11, 1961

## OPTICS

**Sending Light Signals Over Horizon Tested**

► **HOW LIGHT AND INFRARED** signals can be transmitted beyond the horizon at night was reported to the Optical Society of America meeting in Los Angeles.

J. A. Curcio of the U. S. Naval Research Laboratory, Washington, D. C., said studies showed that detectable signals should be received at distances up to 200 or more miles, even when the transmitter and receiver are at sea level.

The light and infrared signals are indirectly transmitted and received because they are scattered by the tiny, aerosol-like particles always present in the earth's low atmosphere. Infrared is superior to visible light for such transmissions because it is not scattered as much by the atmospheric particles.

A high intensity xenon flash tube was used as a projector and an infrared sensitive photoelectric cell as the receiver in the Naval Research Laboratory experiments.

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# IN THE FIELDS

## BIOLOGY

### Migratory Birds Carry Diseases Overseas

► **MIGRATORY BIRDS** in great numbers may spread diseases overseas.

Infected ticks carried as parasites by the birds are responsible for human illness as well as for destroying and stunting the growth of animals in many parts of Africa, Asia, Europe and the Americas.

Dr. Harry Hoogstraal, head of the department of medical zoology, U. S. Naval Medical Research Unit No. 3, Cairo, Egypt, said that control of tick species is made more difficult by the variety of their hosts.

"In newly developing nations that are desperately trying to raise their standards of living," Dr. Hoogstraal told the Naval Medical Research Institute, Bethesda, Md., "the numbers, weight and quality of domestic animals are vital to national well-being."

A tremendous loss of meat available to peoples of the world is caused by virus spread by migratory birds and their attached ticks, Dr. Hoogstraal emphasized. He said the causative virus of Russian spring-summer encephalitis (brain inflammation) has been isolated from a number of mammals and birds as well as from the ticks.

In Egypt, he recovered *Salmonella typhimurium*, a species causing fatal epidemics in some animals and food poisoning in man, from ticks in trees used as heron rookeries.

Dr. Hoogstraal said a large-scale integrated program with close cooperation between workers in virology, ornithology and parasitology would be needed to prove the role of migrating birds in spreading disease.

• Science News Letter, 80:321 November 11, 1961

## EDUCATION

### High School Biology Courses Modernized

► **BIOLOGY COURSES** for high school pupils are being brought up to date.

Memorizing long lists of scientific names and working in a "cookbook" type of laboratory are giving way to experiments that include out-of-class investigation by the more gifted science student.

Dr. Arnold B. Grobman, director of the Biological Sciences Curriculum Study, University of Colorado, Boulder, Colo., reports in *The Journal of Medical Education*, 36: 1253, 1961, that by the summer of 1962 new materials will have been tested in real classroom situations with about 50,000 students and 400 teachers.

Seven laboratory "blocks" now completed are: plant growth and development; microbes, their growth, nutrition and interaction; animal growth and development; interdependence of structure and function;

regulation in plants by hormones; animal behavior; and the ecology of land animals and plants.

These blocks were tested during the 1960-61 school year, and it is planned to design about five more blocks in the immediate future. In practice, a teacher would select one block for use during a particular school year, thus allowing for more flexibility.

New material also is being prepared for teachers of biology in recognition of the fact that a large number of high school instructors did not have adequate preparation. Many principals have asked teachers prepared in home economics, physical education or social studies to take on extra classes in biology because the enrollment was larger than expected.

The revolution in biological education is part of several major course improvement groups financed by the National Science Foundation. A large number of professional scientists on a university level have cooperated with high school teachers in planning modern courses.

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## OCEANOGRAPHY

### Private Industry Will Complete Mohole Project

► **REPRESENTATIVES** from oil companies and other industries have been bidding on a contract to complete the Government's Project Mohole. The project is an attempt to penetrate through the earth's crust to the underlying mantle.

About 12 companies have submitted proposals to handle the engineering and management of the spectacular project, the National Science Foundation said. The Foundation is financing most of the project.

Although the prime purpose of the project is to tell scientists more about the formation of the earth, oil industries will greatly benefit from the new drilling techniques and equipment developed.

The actual Mohole will probably be drilled in about three miles of water where it will penetrate through three miles of ocean-bottom layers to reach the mantle.

In preliminary tests conducted last spring scientists drilled a 600-foot hole in 11,700 feet of water to prove the feasibility of the project.

Project Mohole is the brain-child of the AMSOC (American Miscellaneous Society) of the National Academy of Sciences. Under the leadership of Willard Bascom, plans have reached the present stage of designing a new ship and equipment that will probably make the final probe in 1963.

The crystallizing project is now too large for the Academy, primarily an advisory group, to handle, and the organization has asked to be relieved from the project. The estimated cost of the entire project ranges from \$15,000,000 to \$50,000,000.

The National Science Foundation will shortly announce the winner of the new contract. Presumably, the contract will keep Mr. Bascom and his staff of experts on the project.

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## GENETICS

### Smokers' Lung Function Linked to Heredity

► **THE BREATHING CAPACITY** of tobacco smokers has been linked to heredity as well as environment.

In a study of 302 smokers and non-smokers in the out-patient department of the Sydney (Australia) Hospital, researchers reported that the effect of tobacco smoke alone does not account for decreased breathing capacity.

The mild climate and relatively unpolluted atmosphere of Sydney was believed favorable for the study.

Persons interviewed and tested for maximum breathing capacity and expiratory flow rate were representative of the general population and included friends accompanying the out-patients, as well as medical attendants.

Although smokers generally had eight to ten times more bronchitic symptoms than non-smokers, those who were smokers for a long time showed no increase in symptoms. There was also no tendency for heavy smokers to have poorer breathing capacity than light smokers.

The researchers said that the genetic make-up among smokers would determine whether a person coughed and developed bronchitic symptoms with serious loss of breathing capacity, or showed no symptoms and lost a small amount of ventilatory function.

Further investigation was suggested by Dr. John Read of the University of Sydney and Dr. T. Selby of Sydney Hospital, who report these findings in the *British Medical Journal*, Oct. 28, 1961.

• Science News Letter, 80:321 November 11, 1961

## ASTROPHYSICS

### Cosmic Rays Found Millions Years Old

► **THE COSMIC** radiation bombarding the earth from outer space travels millions of light years before reaching the earth (a light year is the distance light travels in a year at 186,000 miles per second).

Observations from high altitude balloon flights carrying cosmic ray recording photographic plates 136,000 feet above the earth's surface for seven hours allowed U. S. Naval Research Laboratory scientists led by Dr. Maurice M. Shapiro to determine the antiquity of cosmic rays by the relative abundance of light chemical elements in them.

About one-fifth of the chemical elements above helium in primary cosmic radiation consists of the light elements lithium, beryllium, and boron, in spite of the fact that the universal abundance of these light elements is exceedingly low, about one atom in a billion hydrogen atoms.

The new facts do not indicate that cosmic ray sources are as far away as millions of light years because the magnetic fields of the Milky Way galaxy bend the paths of the particles into very tortuous orbits and the cosmic rays, therefore, have taken a roundabout way in traveling to the earth.

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## GENERAL SCIENCE

# Low-Cost Science Christmas

You can stuff a Christmas stocking with a variety of science gifts for no more than the price of postage stamps, Judy Viorst reports.

► IF YOU ARE FACING a long Christmas list and a short supply of money, science gifts can answer many of your problems. SCIENCE SERVICE has examined thousands of materials and come up with a high-quality, low-cost selection of gift suggestions in every scientific field.

Kits, with their lots-of-things-in-one-package appeal, make particularly pleasing science Christmas presents.

Several kits for future paleontologists can be obtained from Science Materials Center, Inc., 59 Fourth Ave., New York 3, N.Y. The DINOSAUR AND FOSSIL KIT includes five samples of real fossils, as well as two dinosaur models and a 160-page book on dinosaurs (\$3). There is also a selection of plastic animal model kits, with 43 to 57 pieces in each kit—TYRANNOSAURUS REX (\$2), STEGOSAURUS (\$1.80), BRONTOSAURUS (\$1) and AMERICAN MASTODON (\$1).

Also available from Science Materials Center is a BASIC KIT OF SHELLS (\$3), with 25 specimens to supplement or begin a shell collection.

Young astronomers and geologists will delight in a METEORITE CRATER STUDY KIT, which has a number of intriguing materials, including the story of Arizona's Barringer crater and fragments of the giant meteorite that plunged into the desert thousands of years ago. The complete kit costs \$1.25, plus 14¢ postage, from the American Meteorite Laboratory, P.O. Box 2098, Denver, Colo.

## Things of Science

Every science has its day in the THINGS of science KITS put out by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington 6, D.C. Each month there is a new assortment of materials and directions for experiments on such subjects as crystallization, static electricity, motors, color top, and ancient gem stones. The kits are 75¢ each, three for \$2, or you can make a gift of a year's subscription for \$5. Two special collections of THINGS kits are also available. For \$6.49 you can purchase 12 kits, with 67 different specimens and materials. Or order the 15-kit collection. There are 129 different specimens and materials represented, and the price is only \$7.97.

Toys, records and games—all with a scientific bent—can be purchased without making a serious dent in your Christmas budget.

A SATURN GYROSCOPE TOP that comes with its pedestal costs only \$1.74. It is sold by the Edmund Scientific Co., 101 East Gloucester Pike, Barrington, N.J.

From Naturegraph Co., Publishers, 8339 West Dry Creek Rd., Healdsburg, Calif.,

you can get fine recordings of bird songs on 78 rpm's—WESTERN BIRD SONGS, FLORIDA BIRD SONGS and THE MOCKING BIRD SINGS, each at \$2.50. The same company has butterfly and sea-shell games, tree games and games of rocks or animals, each priced at \$1.35.

Specimens and slides are always welcomed by young scientists. Inexpensive mineral specimens, with each stone identified, can be purchased from Shipley's Mineral House, Gem Village, Bayfield, Colo. A free Apache Tear comes with the minerals. You can get 15 specimens for 50¢, 18 specimens for 75¢, 24 for \$1, plus 35¢ postage.

Somewhere on your list there must be a boy or girl interested in insects, snakes, lizards, turtles, terrapins, birds, spiders, scorpions, centipedes, North American mammals, zoo animals or ocean life. If so, you probably will want to order several of the 50¢ two-by-two-inch color slides (35mm) that depict these creatures. They can be purchased from Filmscope, Inc., Box 397, Sierra Madre, Calif.

A collection of materials for the young scientist can be obtained from Harry Ross,

Scientific and Lab Apparatus, 61-L Reade St., New York 17, N.Y. A four-inch-diameter magnifier costs \$1 ppd.; the same sum will bring you 12 compasses. Or you can send for a little giant prism suitable for many optical experiments for \$1 plus 50¢ postage.

Science books and booklets can inexpensively fill up a library shelf. For instance:

On aeronautics: THE ARITHMETIC OF FLYING, A DAY IN THE LIFE OF A JET TEST PILOT, HELICOPTERS, AIRCRAFT NUMBER 116, 50¢ each, from the National Aviation Education Council, 1025 Connecticut Ave., N.W., Washington 6, D.C.  
On anthropology: MAN: HIS FIRST MILLION YEARS, by Ashley Montagu, 50¢, available where paperback books are sold.

On atomic energy: LABORATORY EXPERIMENTS WITH RADIOISOTOPES, 35¢, and TEACHING WITH RADIOISOTOPES, 40¢, from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

On botany: GREEN FACTORIES, 20¢, from Cornell Science Leaflet, Mailing Room, Stone Hall, Cornell University, Ithaca, N.Y.

On chemistry: EXPERIMENTING WITH CHEMISTRY and ORGANIC CHEMISTRY FOR THE HOME LAB, by Burton L. Hawk, \$2 each, and THE CHEMICAL ELEMENTS, by Helen Miles



SCIENCE BARGAIN—Low-cost science gifts bring a pleased look to Father's face as he anticipates Christmas.

Davis with revisions by Dr. Glenn T. Seaborg, 55¢, from SCIENCE SERVICE, INC., 1719 N St., N.W., Washington 6, D.C.

On electronics: FIRST BOOK OF RADIO AND ELECTRONICS, \$3, SECOND BOOK OF ELECTRONICS AND RADIO, \$3, ELECTRONIC EXPERIMENTER'S HANDBOOK, \$1, USING ELECTRONICS \$2.50, from Science Materials Center, Inc., 59 Fourth Ave., New York 3, N.Y.

On mathematics: MAGIC HOUSE OF NUMBERS, by Irving Adler, 35¢, available where paperback books are sold.

On medicine: FACING THE FACTS ABOUT CANCER AND EPILEPSY—THE GHOST IS OUT OF THE CLOSET, 25¢ each, from the Public Affairs Committee, Inc., 22 East 38th St., New York 16, N.Y.

On space: ROCKETS INTO SPACE and OPERATION MOON, 60¢ each, from Science Research Associates, 259 East Erie St., Chicago 11, Ill.

On zoology: THE CARE OF TURTLES AND SMALL ALLIGATORS, 20¢, THE STORY OF ELEPHANTS, 10¢, HUMMINGBIRDS, 10¢, PLATYPUS AND ECHIDNA, 15¢, from the New York Zoological Society, Bronx Park, New York 60, N.Y.

Thousands of other low-cost or no-cost science gift suggestions can be found in WONDERFUL WORLD OF SCIENCE. The paperback book may be purchased for 50¢ plus 5¢ postage from SCIENCE SERVICE, INC., 1719 N St., N.W., Washington 6, D.C.

If you want to be the biggest stocking-filler in town this Christmas, you can do so without spending more than postage-stamp money. Gift-worthy science materials—free of charge—will be sent on request from the following sources:

Space Jargon: SPACE TALK, a glossary of astronomical terms, from Republic Aviation Corp., Farmingdale, Long Island, N.Y.

Guide to photomicrography (single copy only): SNAPSHOTS AND SLIDES THROUGH THE MICROSCOPE, from the Eastman Kodak Co., Sales Service Division, 343 State St., Rochester 4, N.Y.

Colorful railroad-facts comic books: THE WHEEL OF PROGRESS, RAILROADS DELIVER THE GOODS, RIDE THE HIGH IRON, SPECIAL AGENT, CLEAR THE TRACK, RAILS ACROSS AMERICA, from the Association of American Railroads, Transportation Building, Washington 6, D.C.

World Book Encyclopedia reprints: BEE AND ANT, from the Field Enterprises Educational Corp., Merchandise Mart Plaza, Chicago 54, Ill.

Conservation materials: JUNIOR FOREST RANGER KIT, posters, stamps, book-marks, calendars, from Smokey Bear's Headquarters, Washington 25, D.C.

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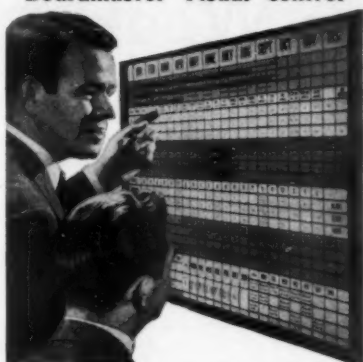
#### GENERAL SCIENCE

### Last Call Goes Out for Science Talent Search

► TEACHERS OF SENIORS who intend to enter this year's Science Talent Search should immediately request examinations from SCIENCE SERVICE, Washington 6, D.C. Parents with sons and daughters who intend to enter should remind teachers to request examinations.

• Science News Letter, 80:323 November 11, 1961

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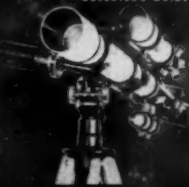
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## The Story of POLLINATION



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Full of appeal for nature lovers of all ages, here is the absorbing story of flower pollination and the curious, involved, and often amusing ways it is accomplished. This engaging book explores the way flowers create their color effects...the mysteries of color vision that make animals react to them...the role of the honey guides in leading the pollinators to the hidden nectar.

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### Other Important Books in The RONALD SCIENCE LIBRARY

#### PLANT LIFE

- The Secret of the Green Thumb. Henry T. Northen and Rebecca T. Northen. (155) \$6.00
- The Green Earth. Harold William Rickett. (163) \$4.50
- Brazil—Orchid of the Tropics. Mulford B. Foster and Racine Sarsay Foster. (164) \$5.00
- A Short History of the Plant Sciences. Howard S. Reed. (165) \$6.50

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- Ways of Mammals. Clifford B. Moore. (146) \$4.00
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- Boy's Book of Turtles and Lizards. Percy A. Morris. (143) \$4.50

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# Books of the Week

For the editorial information of our readers, books received for review are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C.

**ADVANCED ORGANIC CHEMISTRY**—Louis F. Feiser and Mary Feiser—*Reinhold*, 1158 p., illus., \$14. Up-to-date and comprehensive account of fundamental organic chemistry as interpreted by modern theory, covering history, theory and details of experimentation.

**AN ALGORITHM FOR TRANSLATING CHEMICAL NAMES TO MOLECULAR FORMULAS**—Eugene Garfield—*Inst. for Scientific Information*, 68 p., paper, \$5. Algorithm for manual and for computer translation directly from chemical nomenclature.

**ANIMAL BEHAVIOR: Its Evolutionary and Neurological Basis**—V. G. Dethier and Eliot Stellar—*Prentice-Hall*, 118 p., illus., \$2.95; paper, \$1.50. Simple, complex, bilateral and vertebrate nervous systems and behavior.

**AVIATION & SPACE DICTIONARY**—Ernest J. Gentle and Charles Edward Chapel, Eds.—*Aero Press*, 4th ed., 444 p., illus., \$10. Lists 10,000 definitions in aeronautics and space technology.

**BIRTH OF A ROCKET**—Erik Bergaust—*Putnam*, 48 p., illus., \$2.50. Describes parts, assembly and function of modern solid and liquid rockets.

**BLUEPRINT READING: Interpretation of Architectural Working Drawings**—William J. Hornung—*Prentice-Hall*, 129 p., illus., \$6.65. Translates the intricacies of blueprint reading into non-technical language, fully illustrated.

**A CHRONOLOGY AND FACT BOOK OF THE UNITED NATIONS, 1941-1961**—Waldo Chamberlin and Thomas Hovet, Jr., preface by An-

drew W. Cordier—*Oceana*, 64 p., \$2.50; paper, \$1. Useful list of significant events from the origins of the U.N. to the present.

**COASTAL PLANT GEOGRAPHY OF MAURITIUS**—Jonathan D. Sauer—*La. State Univ. Press*, 153 p., illus., paper, \$3. Botanist's field survey report on topography and vegetation of an island in the Indian Ocean.

**GRAVITATIONAL STRESS IN AEROSPACE MEDICINE**—Otto H. Gauer and George D. Zuidema, Eds.—*Little*, 278 p., illus., \$13.50. Comprehensive review of research on the circulatory, nervous and psychological effects of acceleration and G stress on the human system.

**THE GREAT IDEAS TODAY, 1961**—William Benton, Ed.—*Encyclopaedia Britannica (Crowell)*, 562 p., illus., \$8.95. Designed to examine the events and problems of today with reference to the great ideas of the past.

**GROUND COVERS FOR EASIER GARDENING**—Daniel J. Foley—*Chilton Co.*, 224 p., illus., \$5.50. Abundantly illustrated handbook on the selection and care of ground covers, vines and dwarf shrubs.

**GROUND SUPPORT SYSTEMS FOR MISSILES AND SPACE VEHICLES**—Kenneth Brown and Peter Weiser, Eds.—*McGraw*, 490 p., illus., \$15. Complete and practical treatment of systems and subsystems, aimed at reader with engineering background.

**HOW TO KNOW THE BUTTERFLIES**—Paul R. and Anne H. Ehrlich—*Brown, W. C.*, 262 p., illus., \$3.25; paper, \$2.75. Illustrated keys to all categories of North American butterflies from family to species, with notes and index.

**IMPORTED INSECTS**—Naomi Talley—*Dial Press*, 64 p., illus. by H. D. Tee-Van, \$2.50. Tells young people how entomologists search for the natural enemies of insect pests to be imported as "biological controls."

**MATHEMATICAL MODELS**—H. Martyn Cundy and A. P. Rollett—*Oxford Univ. Press*, 2nd ed.,

286 p., illus., \$6.50. Detailed instructions for making wide variety of models illustrating plane and solid geometry.

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• Science News Letter, 80:324 November 11, 1961

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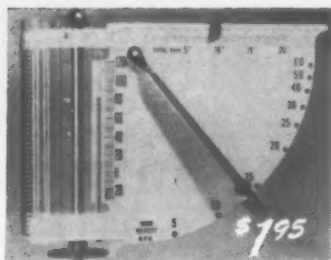
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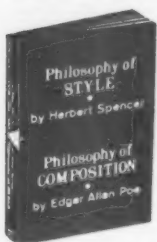
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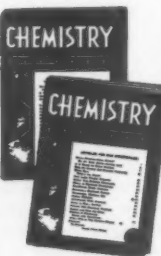
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second largest telescope, the 120-inch reflect-  
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ton, Calif., have given good, clear photo-  
graphs, Dr. A. E. Whitford, director of  
Lick Observatory, reported.

He told the Optical Society of America  
in Los Angeles that the image tube tech-  
nique promises a greater increase in the  
seeing power of telescopes than construction  
of telescopes larger than the present  
world's largest, the 200-inch Hale telescope  
atop Mt. Palomar.

Russian and English astronomers, as well  
as scientists at other United States observa-  
tories, are also working on developing the  
image-tube method.

• Science News Letter, 80:326 November 11, 1961

## MEDICINE

## Teen-Age Girls Can Have Cancer of the Cervix

► **CANCER SMEAR TESTS** may save  
many teenagers from unnecessary death.

Finding positive cancer smears in 77  
girl patients under the age of 20 led a  
Miami doctor to advise smear tests for all  
women old enough to have routine pelvic  
examinations.

Generally such examinations have been  
restricted to women aged 30 and older  
because there is a high prevalence of cervi-  
cal cancer among the older group.

Ten of the 77 girls had never been preg-  
nant, but one girl had been pregnant seven  
times, another five times, and others several  
times. Girls were found with positive smears  
as early as 14 and 15 years of age, Dr. J. H.  
Ferguson of the University of Miami School  
of Medicine-Jackson Memorial Hospital re-  
ported in the Journal of the American  
Medical Association, 178:365, 1961.

Cervical screening tests have saved the  
lives of thousands of women by uncovering  
cancer when it was in the silent stage. In  
the preinvasive stage, cancer of the cervix  
has a 100% cure rate.

• Science News Letter, 80:326 November 11, 1961

## Questions

**INVENTION**—What are the four basic meth-  
ods being tested for confining plasma? p. 318.

**SPACE**—Which liquids were used to relight  
solid rocket fuel for the first time? p. 315.

**Photographs:** Cover and p. 319, U. S. Air Force;  
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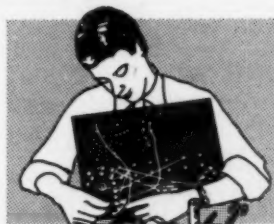
**WHO IS EDMUND C. BERKELEY?** Designer of *Brainiacs*; editor and publisher of the magazine *Computers and Automation*; author of *Giant Brains or Machines That Think* (Wiley), *Computers: Their Operation and Applications* (Reinhold), *Symbolic Logic and Intelligent Machines* (Reinhold); mathematician and actuary—Fellow of the Society of Actuaries.

## IMPROVED BRAINIAC® ELECTRIC BRAIN CONSTRUCTION KIT

Build Over 200 Computing and  
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**K18**, you can build over 200 small electric brain machines and toys which “think,” compute, reason and display intelligent behavior. Each one works on a single flashlight battery . . . is FUN to make, FUN to use and play with, and TEACHES you something new about electrical computing and reasoning circuits. All connections with nuts and bolts—no soldering required. Over 600 parts—including 116 improved patented wipers so that all switches work well; the Brainiac K18 Kit gives full specifications for 201 computing, reasoning, arithmetical, logical, puzzle-solving and game-playing machines. The kit is the result of 12 years’ design and development work with miniature mechanical brains including: Relay Moe (automatic relay machine playing tit-tat-toe—pictured in Life Magazine, March 19, 1956), Simon (miniature automatic digital computer with 129 relays—see “Simple Simon” by E. C. Berkeley in Scientific American November 1, 1950).



**WHAT CAN YOU MAKE WITH BRAINIAC KIT K18?** Over 200 machines including—**LOGIC MACHINES:** Syllogism Prover, Intelligence Test, Boolean Algebra Circuits, Diagnosing Motor Car Trouble, etc. **GAME-PLAYING MACHINES:** Tit-Tat-Toe, Nim, Wheeled Bandit, Sundorra 21, etc. **COMPUTERS:** To add, subtract, multiply or divide using decimal or binary numbers, Money-Changing Machine, etc. **CRYPTOGRAPHIC MACHINES:** Coders, Decoders, Lock with 15,000,000 Combinations, etc. **PUZZLE-SOLVING MACHINES:** The Missionaries and the Cannibals, Age-Guessing Machine, Submarine Rescue Chamber, Fox-Hen-Corn & Hired Man, Uranium Space Ship and the Space Pirates, etc. **QUIZ MACHINE:** The Waxing and the Waning Moon, Polar Air Routes, history, geography, etc.

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- Manual “Brainiacs—Small Electric Brain Machines—Introduction and Explanation” by Edmund C. Berkeley.
- “Introduction to Boolean Algebra for Circuits and Switching” by Edmund C. Berkeley.
- “How to Go from Brainiacs to Automatic Computers” by Edmund C. Berkeley.
- List of references to computer literature.

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# New Ideas and Gadgets

For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE NEWS LETTER, 1719 N St., N.W., Washington, D. C., and ask for Gadget Bulletin 1117. To receive this Gadget Bulletin without special request each week, remit \$1.50 for one year's subscription.

**UNDERWATER ADHESIVE** for vinyl or plastisol bonds under water makes it possible to patch vinyl swimming pools without emptying the pool. A permanent bond is formed by merely applying the adhesive to the patch which is pressed into place. It can also be used to adhere plastisol to metal, wood and other materials.

• Science News Letter, 80:328 November 11, 1961

**COMBINATION CLEANSER-APPLICATOR** that helps take the drudgery out of cleaning consists of a refillable transparent plastic handle to which is attached either a sponge with an abrasive surface or a bowl brush. A special cleaning liquid in the handle is fed through a valve by a flip of the unit.

• Science News Letter, 80:328 November 11, 1961

**AUTOMATIC LIGHT SWITCH** is a compact electronic device that turns electric lights on automatically at nightfall and off at daybreak. Useful to chicken breeders, or in the home, office or store, the small unit plugs into any regular wall outlet of 110-125 volts AC.

• Science News Letter, 80:328 November 11, 1961

**BABY SAFETY HARNESS**, shown in the photograph, permits a child to make a complete 360-degree turn without entanglement. The harness, consisting of shoulder straps and a non-toxic flexible plastic hoop,



is secured to bed or carriage by two cotton washable straps attached to metallic slides movable within a channel on the outside of the hoop. A sleeping child can be turned over without removing the harness.

• Science News Letter, 80:328 November 11, 1961

**STEREO TAPE RECORDER** that combines sound with sound is an invaluable aid in the study of language, music and

drama. A basic track can be recorded and the second track used by the learner for checking purposes. It will reproduce favorite selections from any FM radio or multiplex stereo casts with stereo high fidelity playback, thus saving on disc costs. The recorder plays continuously for up to two hours.

• Science News Letter, 80:328 November 11, 1961

**CHAIN TEMPLATE** for draftsmen and engineers is of clear plastic with several chain sizes. Easy to use, the pocket-size template will save hours of painstaking work and simplify accurate chain drawing.

• Science News Letter, 80:328 November 11, 1961

**PHOTOGRAPHIC FLOOD LIGHT** is a lightweight portable unit with a 20,000 candlepower beam produced by a self-cleaning halogen lamp in a 2 1/4-inch reflector. Battery-powered and rechargeable with an ordinary household electric circuit, the light can be operated for 32 minutes continuously before the battery power-pack needs replacing or recharging.

• Science News Letter, 80:328 November 11, 1961

**SINGLE ICE CUBE TRAY** contains ten separate, unbreakable, plastic freezing cups that hold single cubes of ice. Designed to prevent sticking, each cube can be released from a cup by the warmth of the hand.

• Science News Letter, 80:328 November 11, 1961



## Nature Ramblings



### Pumpkin



➤ **TECHNICALLY SPEAKING**, the pumpkin is a fruit. Deep yellow and nearly round, it is both versatile and valuable. It is versatile because it served as a coach for Cinderella, and as a cache for stolen Government papers a number of years ago. And for many an October, its hollowed-out shell has served as a lantern to be lighted on All Hallows Eve, or Halloween—the evening before All Saints' Day.

The pumpkin is valuable because it is rich in carbohydrates and minerals, especially phosphorus, calcium and iron. And its flat, white seeds are a fine wildlife food for a number of birds.

Although plenty of pumpkins are in market early for the jack-o'-lantern trade, most are harvested between Halloween and Thanksgiving. The greater part of the harvest is for canning because this fruit is a "long-keeping" one. Each pumpkin supplies a lot of meat for canning because the average weight of each is 10 to 20 pounds. Extra-large ones often weigh as much as 75 pounds.

The pumpkin is thought to be native to Chile, although it may have been brought

to that country from Asia in prehistoric times. Various forms of this fruit, including the common field pumpkin (*Cucurbita pepo*), were being raised by the Indians at the time of the colonization of North America.

In pie form, the pumpkin is closely associated with Thanksgiving. Some historians state there is no evidence to prove this fruit was served in any form at the first Thanksgiving dinner in 1621. But a source such as the second edition of The Columbia Encyclopedia states, "It was among the fruits of the first Thanksgiving celebration of the Pilgrims."

• Science News Letter, 80:328 November 11, 1961

## Do You Know?

Over one-fourth of all industry in Canada is controlled in the United States.

Alpha radiation known to exist in outer space could affect man's brain and is a potential hazard in manned space flight.

Particles of refractory compounds such as carbides are formed into almost perfect spheres by placing them in a plasma jet where they melt and solidify while still in motion.

Color in dreams is reported more frequently by children than by adults.

A new type of toothbrush that vacuums the teeth has been devised for use in hospitals on patients unable to brush their teeth by themselves.

The common onion had its origin in south central Asia.

Glass has been used by man for over 5,000 years.

• Science News Letter, 80:328 November 11, 1961

